

Simultaneous Tailoring of Surface Topography and Chemical Structure for Controlled Wettability

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Charged nano-latex particles were adsorbed to oppositely charged substrates to form surfaces with different topographies. The introduction of discrete functional groups to smooth and rough surfaces through organic transformations indicates that roughness enhances both hydrophobicity and hydrophilicity. Particle size and bimodal particle size distribution have significant impact on wettability. A hydrophobic surface exhibiting water contact angles of $150^\circ/126^\circ$ (θ_A/θ_R) and a hydrophilic surface of $18^\circ/8^\circ$ (θ_A/θ_R) prepared by adsorption of 1-octadecanethiol and poly(vinyl alcohol), respectively, were prepared on gold-coated surfaces containing both 0.1 and 0.35 μm latex particles. The combination of surface topography and surface-chemical functionality permits wettability control over a wide range.

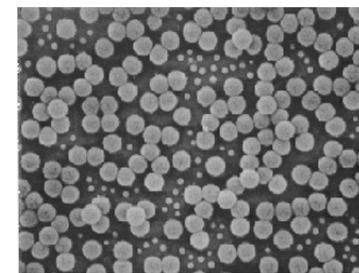


Fig 1. SEM of a surface with 0.1 and 0.35 μm particles.

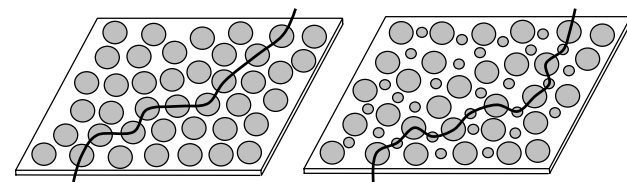


Fig 2. Three phase (air-liquid-surface) contact lines of a water droplet on a surface adsorbed with monodisperse particles (left) and a surface containing bimodal particles (right, more tortuous).

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Education:

- Under this grant, Linda Paradis has completed her M.A. degree; Nui Takeshita and Mamle Quarmyne have completed their B.A. degrees recently after being supported for two years; Rose Ndong and Surangkana Martwiset are currently involved in the project.

- All the undergraduates involved in the project are recruited early, typically during their first or second years, to engage in frontier research. They typically spend their summers full time and academic years part time (~15 h per wk) doing research. They have been exceptionally productive - three articles have resulted from research supported by this grant.

-Takeshita, N.; Paradis, L. A.; Chen, W. *Langmuir*, in press.

- Kozlov, M.; Quarmyne, M.; Chen, W.; McCarthy, T. J. *Macromolecules* **2003**, 36, 6054.

- Quarmyne, M.; Chen, W. *Langmuir* **2003**, 19, 2533.

Human Resources/Outreach:

- Minority students are particularly encouraged to participate in research. Out of five students supported by this grant, two are minorities.

- My students and I carried out the “Polymer Slime” experiment with 12 local high school minority students to get them excited about polymers.



Research group picture 2004